

**Claims****What is claimed is:**

1. An integrated cross-switching unit, which is used for SDH system comprising an SDH line unit and a data service processing unit, comprising:

a bus identification module;

a cross-connecting module;

a mapping/de-mapping module;

an encapsulation/de-encapsulation module; and

a packet scheduling module; wherein

the bus identification module transmits the data service and/or TDM service from the SDH line unit to the cross-connecting unit and transmits the data service from the data service processing unit to the packet scheduling module;

the cross-connecting module implements cross-scheduling for time slots of the TDM service, and schedules the time slots corresponding to the data service from the SDH line unit to the mapping/de-mapping module;

the mapping/de-mapping module receives data frames from the cross-connecting module, and implements mapping for the data from the encapsulation/de-encapsulation module;

the encapsulation/de-encapsulation module receives the data frames from the mapping/de-mapping module, implements data link layer de-encapsulation, and encapsulates the packets from the packet scheduling module;

the packet scheduling module receives the data packets from the encapsulation/de-encapsulation module and/or the bus identification module to implement label-based packet

scheduling; transmitting the scheduled data to the data service processing unit via packet bus or to the SDH line unit via the encapsulation/de-encapsulation module, the mapping/de-mapping module and the cross-connecting unit in turn.

2. The integrated cross-switching unit according to claim 1, wherein a plurality of physical channels are configured between the mapping/de-mapping module and the encapsulation/de-encapsulation module, and between the encapsulation/de-encapsulation module and the packet scheduling module.

3. The integrated cross-switching unit according to claim 2, wherein the plurality of physical channels are configured with different encapsulation protocols respectively.

4. The integrated cross-switching unit according to claim 2, wherein for the GFP frames from different physical channels, the encapsulation/de-encapsulation module finds CID field in the extended header of each GFP frame and directly forwards the data frame with the CID field into the corresponding physical channel.

5. An integrated cross-switching unit, which is used for SDH system including an SDH line unit and a data service processing unit, comprising:

- a bus identification module;
- a high-order cross-connecting module;

a high-order mapping/de-mapping module;  
a high-order encapsulation/de-encapsulation module;  
a high-order packet scheduling module;  
a low-order cross-connecting module;  
5 a low-order mapping/de-mapping module;  
a low-order encapsulation/de-encapsulation module; and  
a low-order packet scheduling module; wherein

the bus identification module transmits the data service  
and/or TDM service from the SDH line unit to the high-order  
10 cross-connecting module, and transmits the data service from  
the data service processing unit to the high-order packet  
scheduling module;

the high-order cross-connecting module schedules the  
service as required for low-order processing to the low-order  
15 cross-connecting module, implements cross-scheduling for time  
slots of high-order TDM service, and schedules the time slots  
corresponding to the high-order data service from the SDH line  
unit to the high-order mapping/de-mapping module;

the low-order cross-connecting module implements  
20 cross-scheduling for time slots of low-order TDM service, and  
schedules the time slots corresponding to the low-order data  
service from the SDH line unit to the low-order  
mapping/de-mapping module;

the high-order and low-order mapping/de-mapping modules  
25 receive the data frames from the high-order and low-order  
cross-connecting modules correspondingly, and implement  
mapping for the data from the high-order and low-order  
encapsulation/de-encapsulation modules respectively;

the high-order and low-order

encapsulation/de-encapsulation modules receive the data frames from the high-order and low-order mapping/de-mapping modules correspondingly, implement data link layer de-encapsulation, and encapsulate the packets from the high-order and low-order packet scheduling modules respectively;

the high-order packet scheduling module receives the data packets from the high-order encapsulation/de-encapsulation module and/or the bus identification module and implements label-based packet scheduling; transmits the scheduled data to the data service processing unit via packet bus or to the SDH line unit via the high-order encapsulation/de-encapsulation module, the high-order mapping/de-mapping unit and the high-order cross-connecting module in turn;

the low-order packet scheduling module receives the data packets from the low-order encapsulation/de-encapsulation module and implements label-based packet scheduling; transmits the scheduled data to the SDH line unit via the low-order encapsulation/de-encapsulation module, the low-order mapping/de-mapping unit and the low-order cross-connecting module in turn.

6. A service scheduling method implemented by the integrated cross-switching unit of claim 1, comprising the steps of:

A) a bus identification module transmitting the data service and/or TDM service from the SDH line unit to the cross-connecting module, and going to step B); transmitting the data service from the data service processing unit to the packet

scheduling module, and going to step C);

5       B)     the     cross-connecting     module     implementing  
cross-scheduling for time slots of the TDM service, and  
transmitting the scheduled data to the SDH line unit; or  
scheduling the time slots corresponding to the data service from  
the SDH line unit to the mapping/de-mapping module, the  
encapsulation/de-encapsulation module receiving the data  
service from the mapping/de-mapping module and transmitting the  
data service to the packet scheduling module, and going to step  
10    C);

      C)   the packet scheduling module implementing packet  
scheduling for the data service; transmitting the scheduled  
data to the data service processing unit via packet bus, or to  
the SDH line unit via the encapsulation/de-encapsulation module,  
15   the mapping/de-mapping module and the cross-connecting module  
in turn.

      7. The service scheduling method according to claim 6,  
wherein the bus identification module reports the slot number  
20   corresponding to the data service processing unit and unit type  
of the data service processing unit to the control unit via the  
data service processing unit, and identifies the type of the  
bus connected with the processing unit as backplane packet bus  
to identify service source.

25       8. The service scheduling method according to claim 6,  
wherein the SDH line unit and the data service processing unit  
copy the service to a first integrated cross-switching unit and  
a second integrated cross-switching unit which have the same

function and structure to implement the same service scheduling procedure; if the first integrated cross-switching unit and the second integrated cross-switching unit are both normal, the SDH line unit and the data service processing unit receive the same service streams from the first integrated cross-switching unit and the second integrated cross-switching unit , and select either of them to implement a processing based on the service streams; if either of the first integrated cross-switching unit and the second integrated cross-switching unit goes wrong, the faulted integrated cross-switching unit reports to the control unit, and the control unit instructs the SDH line unit and the data service processing unit to select the service stream of the normal integrated cross-switching unit.

9. The service scheduling method according to claim 6, wherein the SDH line unit and the data service processing unit copy the service to the first integrated cross-switching unit and the second integrated cross-switching unit which have the same function and structure to implement the same service scheduling procedure; the SDH line unit and the data service processing unit receive the same service streams from the first integrated cross-switching unit and the second integrated cross-switching unit , determine whether the two service streams are normal, and select either of them and implement a processing based on the service streams if the two service streams are both normal; if either of them is abnormal, select the normal service stream.

10. The service scheduling method according to claim 6,

wherein the SDH line unit and the data service processing unit allocate the service to the first integrated cross-switching unit and the second integrated cross-switching unit which have the same function and structure to implement service scheduling;  
5 if the first integrated cross-switching unit and the second integrated cross-switching unit are both normal, the SDH line unit and the data service processing unit receive the service streams from the first integrated cross-switching unit and the second integrated cross-switching unit to implement a  
10 processing based on the service streams; if either of the first integrated cross-switching unit and the second integrated cross-switching unit goes wrong, the faulted integrated cross-switching unit reports to the control unit, and the control unit instructs the SDH line unit and the data service  
15 processing unit to switch the service allocated to the faulted integrated cross-switching unit to the normal integrated cross-switching unit.

11. The service scheduling method according to claim 6,  
20 wherein the SDH line unit and the data service processing unit allocate the service to the first integrated cross-switching unit and the second integrated cross-switching unit which have the same function and structure to implement service scheduling; the SDH line unit and the data service processing unit receive  
25 the service streams from the first integrated cross-switching unit and the second integrated cross-switching unit and determine whether the service streams are normal; if either of the service streams is abnormal, switch the service of the integrated cross-switching unit corresponding to the abnormal

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service stream to the normal integrated cross-switching unit.

12. The service scheduling method according to claim 9 or 10, wherein the service allocated to the first integrated cross-switching unit and the second integrated cross-switching unit has priority; when either of the integrated cross-switching units goes wrong and needs service switching, the high-priority service can substitute the low-priority service under processing.